

NOTES ON THE MITE *PEDICULOIDES VENTRICOSUS*
NEWPORT.¹

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The mite *Pediculoides ventricosus* Newport, attracted my attention when it completely destroyed several hundred parasites, which I was rearing. This acarid has been described as both beneficial and noxious, but this difference of opinion appears natural when one considers its wide range and the large number of insect species which it attacks. Moreover, it has been definitely shown to cause an irritating form of dermatitis in man.

Pediculoides ventricosus was observed by Newport in 1849 in the nests of *Anthophora retusa* at Gravesend, England, and was described by him in a published record in 1853. In 1879, Geber observed in Lower Hungary an eruptive epidemic coming from barley, and his investigations showed an acarid responsible for the dermatitis. Webster says that it would seem quite probable from Geber's illustrations, that the mite involved in the epidemic might have been *Pediculoides ventricosus*. The mite was first recorded in America in 1882 by Webster, who held that it had probably not only occurred as early as 1830 in Massachusetts, but it had also, at that date, become noxious to man. Harris in the second edition of his "Insects Injurious to Vegetation" refers to an observation he made in 1844 at Cambridge, that straw bed ticks had proved very troublesome to children sleeping on them because of insect bites. Harris ascribed the bites to *Isosoma hordei*, but Webster believes that it is more likely that *Pediculoides* was the cause of the dermatitis. Since 1884, many notes on the attacks of the mite upon both man and insects, have been made.

Pediculoides is widely distributed. It has been reported throughout the United States and Canada, especially in the regions where grain is grown, in virtually all of Europe, parts of Africa, notably Egypt, and in India.

This mite feeds principally upon larvæ and pupæ of such a

¹Contribution from the Entomological Laboratory of the Bussey Institution, Harvard University. No. 285.

great variety of insects, that a complete list would be very difficult to give. It occurs most abundantly, however, in connection with cereal insects such as, *Sitotroga cerealella* Oliv., *Sitophilus granarius*, Linn., *S. oryza* Linn., and notably, *Isosoma* species, all of which are greatly checked. It also feeds upon the parasites of these and of other insects and would, probably, feed upon any insect that was unable to escape. Because it controls the depredations of many destructive insects, *Pediculoides* has been considered beneficial from an economic standpoint.

In contrast to this view, the mite has been considered noxious, principally, because it causes a disagreeable, eruptive dermatitis, which is accompanied by a severe itching. If enough lesions are made, the person afflicted will have other symptoms, such as a rise in temperature, an acceleration of the heart rate, intense headache, anorexia, nausea, and diarrhœa. Such cases occur in the harvest fields of the Middle West, and in grain elevators, warehouses, and farm homes that have fresh straw mattresses. Here the mite is associated, of course, with the cereal insects mentioned.

In my opinion, *Pediculoides* is noxious to a degree as yet not realized, for another reason, and that is, its destruction of parasites. It has been widely observed that parasites of a great variety of insects are attacked by this predaceous mite, but it appears that these facts have not been stressed. Parasites reared in cultures in the laboratory are very commonly completely destroyed. Lichtenstein in France in 1863 stated that he could not for six months, breed a single specimen of Hymenoptera, while Buprestids, Cerambycids, and some Lepidoptera were also completely destroyed. Berlese cites the fact that Newport was forced to abandon the rearing of hymenopterous larvæ, while Essig mentions that in the rearing of hymenopterous parasites for the control of scale insects in California, the mite not only destroyed all the parasites in some insectaries, but also attacked the attendants.

My own experience follows:—The prepupæ of *Eurytoma pissodis* Gir., a hymenopterous parasite of the white pine weevil, *Pissodes strobi* Peck, were dissected out of the larval chambers

of the weevil and placed in rearing tubes of glass, closed at one end with plaster of Paris and at the other with cotton. During October and November the prepupæ showed no evidences of attack by *Pediculoides*. In the tubes there was considerable débris, consisting of wisps of wood formed by the weevil larvæ, and particles of decayed bark. Without doubt, mites were in the débris at this time but they were unnoticed. The tubes were kept outdoors until the end of December and were then placed in a greenhouse at a temperature of 60° F. or more, while the prepupæ still appeared perfectly healthy. In mid-January,

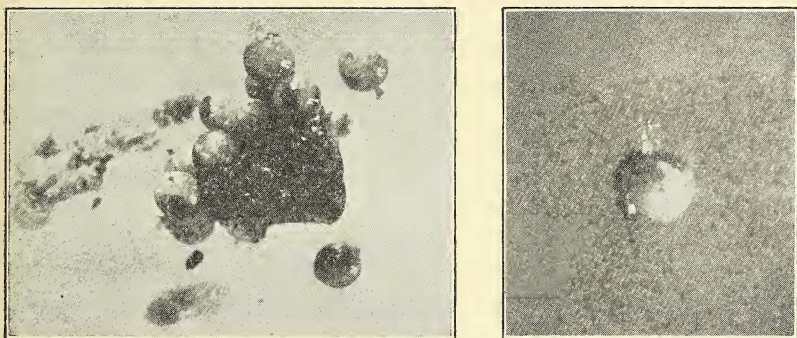


Fig. 1 At left, *Eurytoma* prepupa infested with mites; at right, gravid female of *Pediculoides ventricosus*.

when a number of the prepupæ turned lemon yellow, they were culled from the tubes and isolated. Within three or four days, there appeared upon the surface of each yellow prepupa, one or two characteristic, pale yellow spheres, the abdomens of the mites. Within a week the number had increased to three or four, and at the end of three weeks the number was ten to twenty. From this time, the prepupæ decreased in size slowly, while the number of new mites apparently did not increase as rapidly as before. The figure shows a prepupa after six or seven weeks. It has lost more than half its size and the wrinkled surface is covered with mites. The spheres in the background are the abdomens of mites that have fallen off in the preparation of the material for photographing, since they are easily dislodged

when gravid. The prepupæ left in the tubes eventually passed through the same stages of infestation. The apparently uninfested prepupæ are of a creamy white appearance and often move slightly. No matter how frequently they were transferred to sterile tubes during January and February, all of them were destroyed. Thus, of several hundred prepupæ, only five reached the pupa stage and these, with one exception, died, covered with mites. The exceptional one attained the adult stage but did not live long enough to disengage the pupa skin completely.

It is probable that *Pediculoides* was able to infest a prepupa for several days without any evidence of its presence, since, although each prepupa was brushed and examined carefully before isolation, the mite invariably appeared. It is also probable that a prepupa, at the time of its transference, might have had one or several mites upon its surface which survived the brushing and escaped notice. That this acarid could remain unnoticed, is at least possible, because of its minute size, pale color, and semi-translucency when young. It is also possible that it may penetrate into the spiracles of the prepupa.

Some other parasites of the white pine weevil, namely several Braconids that pupate in pupa cases or cocoons in the larval chambers of the weevil, were not attacked by *Pediculoides*, although they were reared throughout in unsterilized tubes. Whole sections of twigs were in the tubes in this case; much frass and decaying bark was present, yet the emergence percentage was very high. In the material dissected, however, many intact cocoons were found which were shrivelled and which showed that they had been destroyed by some agency which may have been the mite. In other weevil larval chambers, groups of mites were found with remains sufficiently indefinite to defy analysis, although very probably, they were examples of *Eurytoma pissodis* which were destroyed under natural conditions, since abundant evidence, such as no weevil emergence hole in the wood, the size of the twig, and contiguous *Eurytoma* prepupæ, pointed that way. No clear cut case of mite destruction of weevil larvæ was observed, though this proves nothing, since, at the time of dissection, at least three months had elapsed since the weevil larvæ were in the shoots. Several cases of mite destruction of unde-

terminated coleopterous larvæ were observed. The mites in the white pine terminal shoots were, in general, most abundant directly under the bark where, in this damp situation, they probably feed upon dipterous larvæ.

A brief description of *Pediculoides ventricosus* may be useful. The males and unfed females are a pale straw color and measure 1-5th mm. and less. The male remains slender, but the abdomen of the female swells enormously, assumes a spherical form, and attains a diameter of nearly 1 mm. Through the virtually transparent body wall of the abdomen, the contents, which are rather thin in consistency, appear the color of the yolk of a hen's egg or lighter, with amorphous masses of a milky white substance throughout the yellow, though these are usually more or less localized. This amorphous white substance appears to be connected with the soft, rather globular eggs, which may be readily observed and counted. From two to thirty eggs have been observed in progressive stages of development, though Webster has counted forty to fifty. In mites that have been in dry surroundings, and perhaps in general, in the case of older mites, the yellow substance is thicker on one side of the abdomen and assumes a dark brown color.

The life history of *Pediculoides* does not seem to have been completely worked out. Newport, who observed it in 1849, believed that the species was parthenogenic. Webster, in 1882, was inclined to agree with Newport, although he states later that he has noticed an occasional male. In this early paper, Webster says that the young not only hatch within the bladder-like abdomen but attain their full development there, and are liberated as they are developed. In breaking up the abdomen of the female, I have observed young mites crawling out of the fluid contents. Essig, in his text, "Insects of Western North America," adds that *Pediculoides* mates soon after birth. Under favorable conditions they increase rapidly. When feeding, they crawl about upon a larva or a pupa, often puncturing the skin within a few minutes after discovering the prey, and then they more or less continuously suck the juices. It is interesting to note that the prepupæ observed moved violently when a mite was placed upon them, but ceased the alternate curling and

straightening within a minute, and then repeated this behavior several times within an hour. The females, which form a large majority of the individuals apparently tend to remain attached to the original puncture till disturbed, their abdomens swelling to a size 10 to 50 times that of the cephalothorax. If the prey is fresh, the mites are aided in their attachment by the adhesive quality of the fluid that issues from the punctured body. If brushed off they will puncture in the next place at which contact is established, although their mobility decreases, of course, with their growth. As seen in the figure, the mites appear as globular excrescences upon the surface of the infested larva or pupa, since the cephalothorax is hidden by the enlarged abdomen and may be more or less intruded into the body of the host.

Control of *Pediculoides*, natural or otherwise, has not been worked out and references to its control are very rare in the literature. That it has some natural enemies seems probable, because without some check, and with its capacities for increase and for destruction of insects, it would soon become more conspicuous. Under natural conditions in the white pine leaders, however, this acarid is not found in every part of the shoot, and in this fact lies the explanation of how a certain number of parasites may survive.

In conclusion, I offer the suggestion that *Pediculoides ventricosus* is more of a factor in economic entomology than is realized. Beneficial in checking cereal insects, it is not a completely welcome agency there, as it may seriously impair the efficiency of the harvest hands and other grain workers. Apart from this, it probably does more harm than good, all things considered, as it destroys parasites that have many times its own predatory power in controlling injurious insects. A compilation of tests for the purpose of ascertaining whether the mite prefers parasites in dead wood and straw, or whether it prefers wood-borers and stem-borers in material which is fresher or not entirely dead, and has less decaying bark, would be interesting.

ABSTRACT.

The mite, *Pediculoides ventricosus* Newport, is beneficial in destroying cereal insects, notably *Isosoma* species, and others.

It is noxious in causing dermatitis in man. The writer has lost several hundred hymenopterous parasites of the white pine weevil—as have others in rearing various parasites. The suggestion is made that the mite is more harmful than realized, as the parasites it destroys probably would kill more injurious insects than does the mite.

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